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PALEOBOTANY.—*A Lower Cretaceous flora in Colorado.* T. D. A. COCKERELL, University of Colorado.

During the past summer Mr. Terry Duce, working for the Geological Survey of Colorado, was so fortunate as to find a new locality for Mesozoic plants, with fairly abundant remains. The locality is on the high point between Cutthroat Gulch and Hovenweep Canyon, Lat. $37^{\circ}, 53' N.$, Long. $108^{\circ}, 57' W.$ The greater part of the section there exposed is assigned to the McElmo, presumed to be Jurassic. Above the McElmo black shales alternate with massive sandstone, the two combined including the uppermost 131 feet of the whole exposure, which measures some 410 feet. The plants are preserved in hard white quartzose sandstone, with occasional iron concretions, about 10 feet below the top of the section. This flora is of peculiar interest, not only for the light it throws on the age of the strata, but especially because it belongs to the period when angiospermous plants were just beginning to appear. One of the greatest puzzles in evolution is the apparently sudden arrival of the angiosperms during the Mesozoic; at first represented by few species, but presently developing a remarkable series of broad-leafed trees, including generic types apparently identical with those now living. Any plant material from the period which saw the dawn of the higher plants in North America is therefore of particular value, although we must doubtless go to some very different part of the globe to find, if they ever are found, the immediate ancestors of the Cretaceous angiosperms.¹

At the beginning of my studies of Mr. Duce's material I sent photographs of the best specimens to Dr. A. C. Seward and Dr. Edward W. Berry, both of whom very kindly reviewed and criticised my preliminary determinations. There is in the collection only one species which can claim to be an angiosperm. Elongate-lanceolate willow-like leaves, at first rather suggesting some *Podozamites*,² are seen on closer inspection to have lateral

¹ For a most interesting discussion of this problem, see Weiland, G. R.: Amer. Journ. Sci. **38**: 541-460. 1914.

² See, Seward, A. C., Jurassic Plants from Caucasia and Turkestan: Mém. d. Comité-Géolog. (St. Petersburg), N. S., **38**: pl. 8, fig. 68. 1907.

veins leaving a midrib, curving more or less, and at least toward the apex of the leaf uniting to form a series of arches. These leaves are evidently those of *Sapindopsis*, and may well belong to the species *S. variabilis* Fontaine, although the lateral veins appear to form a more acute angle with the midrib than in that species as figured by Berry.³ Berry refers this genus with confidence to the modern family Sapindaceae, but we should like to see the reproductive parts. Is it possibly something more than a coincidence that the venation is of the same type as that of *Gnetum*, the modern broad-leaved gymnosperm?

Equisetaceous stems, the larger about 8 mm. in diameter, with about nine striae, may well represent the species *Equisetum*

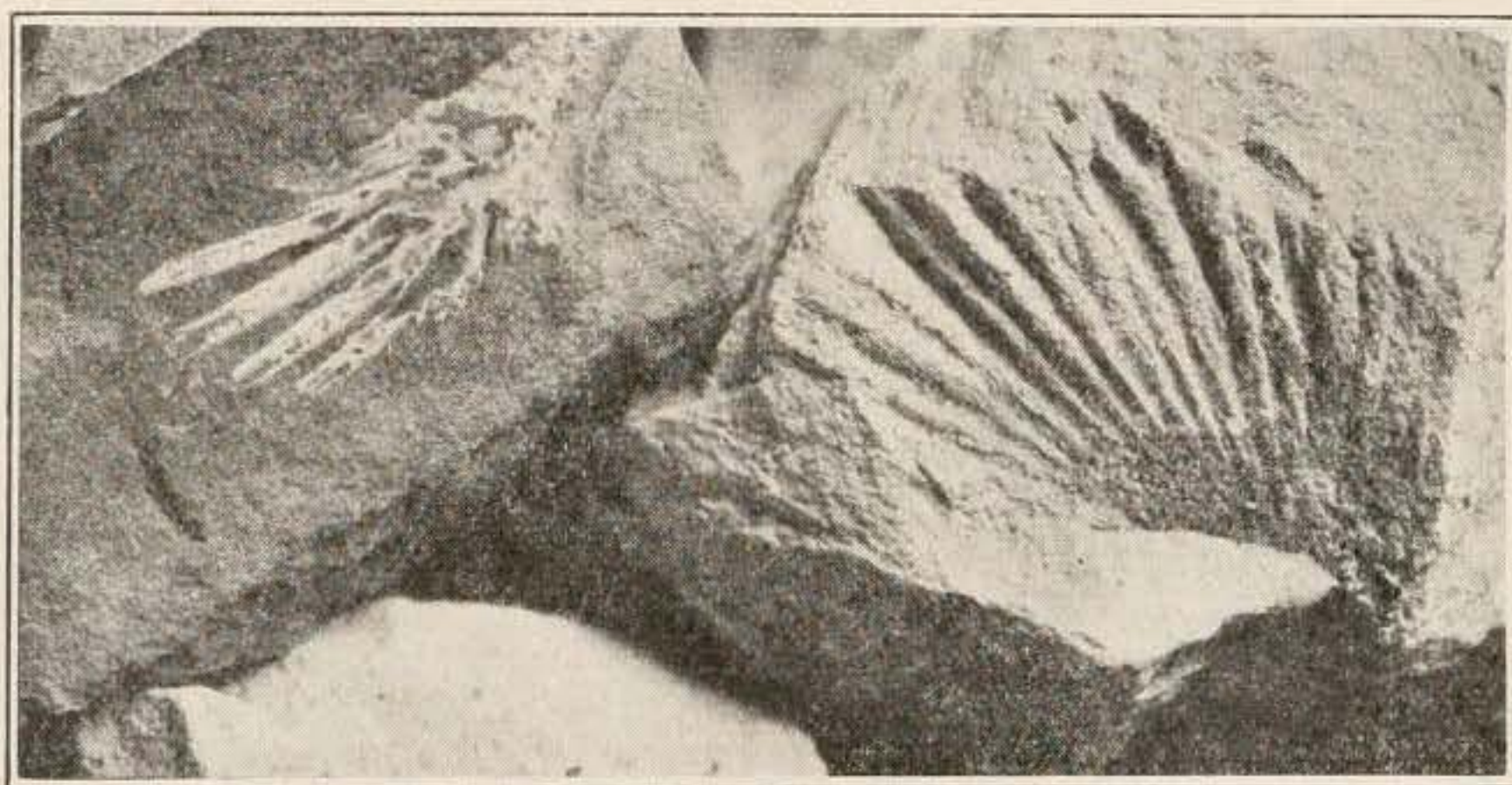


Fig. 1. *Cycadospadix* (?) sp. About natural size.

burchardti (Dunker) Brongn., but the sheaths are unfortunately wanting.

Some curious palmlike structures, certainly not palms, closely resemble *Cycadospadix*.⁴ They represent possibly more than one organism, and one of the specimens, Dr. Berry notes, has some resemblance to the base of a fern such as *Matonidium*; it appears that Lignier, some years ago, actually described fern-remains of this type as a Jurassic palm.

The best preserved specimens in the collection are elongate

³ Maryland Geol. Surv., Lower Cretaceous, pl. 83. 1911.

⁴ Schenk, A., in Zittel, Handb. Palaeontologie, Abt. II, Palaeophytologie, 228. 1890. Also, Dr. Seward, after examining the photographs, suggests comparison with Trans. Roy. Soc. Edinburgh, 47: 699, pl. 7, fig. 18. 1911.

pinnae which I refer with confidence to *Matonidium althausii* (Dunker) Ward. Although the sori, from the nature of the sandstone matrix, are poorly preserved, the structure appears to agree exactly with this species, especially as figured by Seward.⁵ Dr. Seward, also, after examining the photographs, states that he has little doubt that the specimens belong to *Matonidium*. This plant is a fern of peculiar interest, as it appears to be the ancestor of the isolated modern genus *Matonia*, found in Borneo and the Malay peninsula. *Matonidium althausii* is a well-known European fossil, but the Colorado specimens present no differences that can be seen.

The collection also contains some ferns which agree very well with *Todites*, so far as appearances go, but there are no sori, and exact determination is not possible. Some specimens could belong to *Weichselia*, or even better, as Dr. Berry suggests, to *Cladophlebis*. One fragment appears to agree exactly with *Onychiopsis*.

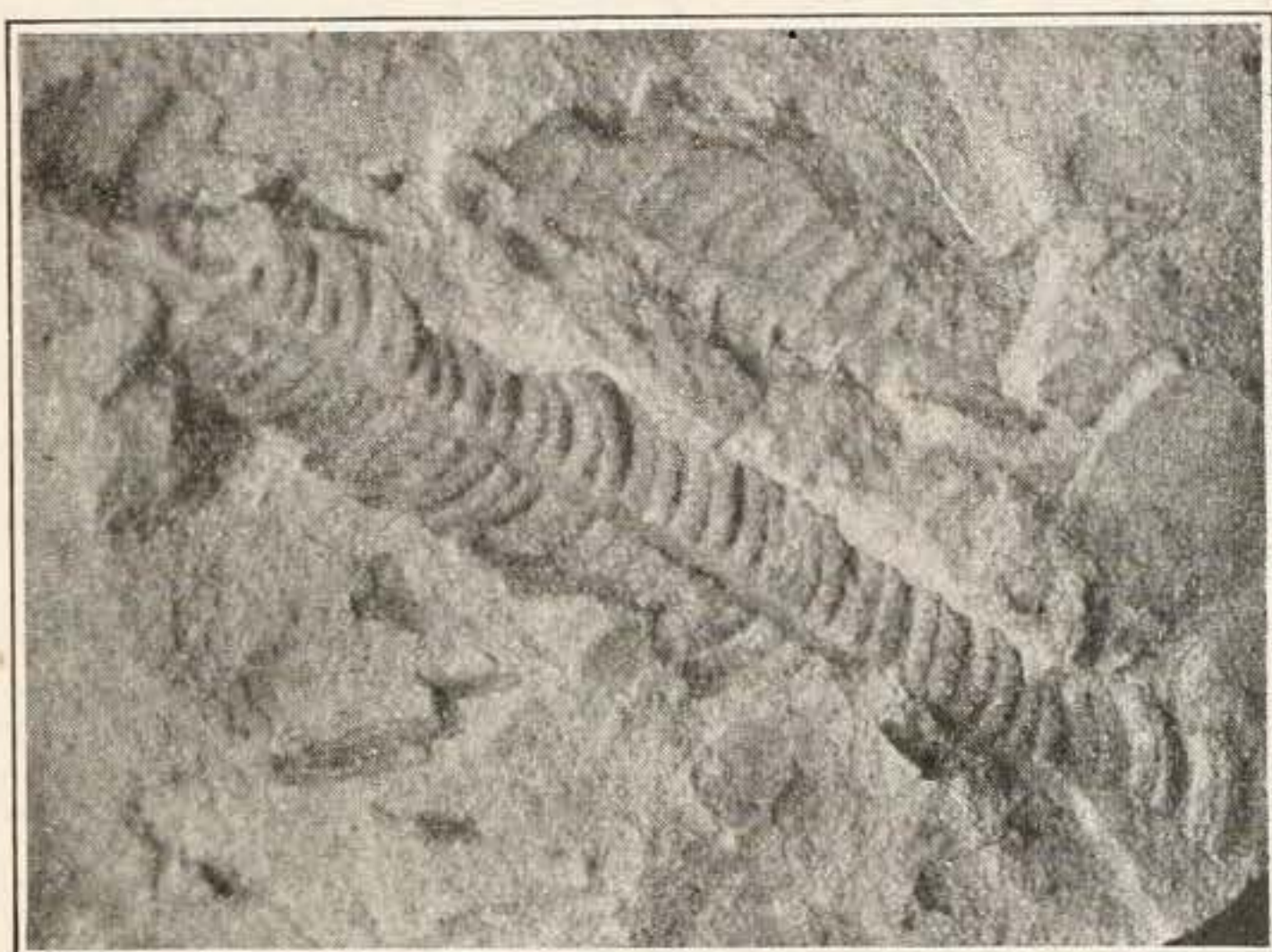


Fig. 2. *Matonidium althausii* (Dunker) Ward.
About natural size.

Searching for a corresponding flora in the records, we find the nearest approach in the Fuson formation of the Black Hills, from which 26 species have been recorded by Ward and Fontaine.⁶ The Fuson list contains *Matonidium althausii*, *Sapindopsis variabilis*, *Equisetum burchardti*, *Cladophlebis*, and *Weichselia*. According to Berry this is approximately contemporaneous with the Patapsco of Maryland and Virginia; which, however, contains a much greater variety of angiosperms. The Fuson list includes, in addition to *Sapindopsis*, fragments referred to *Ulmiphyllum*, *Quercophyllum*, and *Ficophyllum*. Berry notes

⁵ Jurassic Flora. I. The Yorkshire Coast, 76. fig. 7A. 1900.

⁶ U. S. Geol. Surv., 19th Ann. Rept., pt. 2. 1899.

that the first of these is really a fern, and that the last is at any rate not a true *Ficophyllum*. The *Quercophyllum* could possibly be *Dictyophyllum*, a fern. Thus the angiospermous flora of the Fuson is not beyond suspicion, and apparently the beds may be regarded as somewhat older than the Patapsco. It would be possible to regard the Colorado material as contemporaneous with the Fuson, or somewhat older, but apparently younger than the Kootanie.

A note may be added concerning *Weichselia reticulata* (Stokes & Webb) Ward, reported from the Fuson. Seward⁷ gives a detailed drawing of the venation of a specimen from Bernissart, Belgium, and it must be said that this is rather strikingly different from the venation of the pinnules of the Black Hills plant, as shown in Ward's report. It may be, therefore, that our Lower Cretaceous plant is a distinct species. Seward remarks on the absence of fructification in specimens of *Weichselia*, and suggests that it may not be a true fern, but Zeiller,⁸ recording specimens from Peru, states that he found fertile fronds, and that the plant is really a fern, perhaps a member of the Marattiaceae.

BOTANY.—*Inophloeum*, a new genus of the mulberry family.

HENRY PITTIER, Bureau of Plant Industry.

Under the name *Olmedia? armata* Miquel described briefly in 1854 a remarkable moraceous tree, a meager specimen of which was collected by Seemann on the Cupica River in the Colombian Darien. That he remained in doubt as to the proper place of the species is shown by the question mark following the generic name and by the following remark preceding the description: "Valdopere dolendum, stirpem admodum memorabilem ex unico parvulo ramulo vix certe definiendam nec apte describendam esse."¹

In the course of the botanical survey of Panama I have collected specimens of the same tree at several places in the forests to the east of the Canal, and from a specimen of the bark in the

⁷ Fossil Plants, 2: 495. 1910.

⁸ Compt. Rend., Acad. Sci. (Paris), June 6, 1910.

¹ In Seemann, Bot. Voy. Herald, 196.